Listing of Claims

Please cancel claims 47, 48, 57, 58, 61, 64, 68, 69 and 74-87 without prejudice.

The status of the claims of the case are as follows:

Claims 1-39 (canceled)

~~40~~ (previously presented) A catalyst having activity under an irradiation of visible light in a wavelength region from about 400 to 600 nm, comprising titanium dioxide having stable oxygen defects and exhibiting NOx oxidation activity under the irradiation of a visible light at least in the wavelength region of from about 400 to 600 nm; and said titanium dioxide further having a peak area ratio (O1s/Ti2p) of a peak area obtained by X-ray photoelectron spectroscopy assigned to the 1s electrons of oxygen (O1s) participating in the bonds with titanium to a peak area obtained by X-ray photoelectron spectroscopy assigned to the 2p electrons of titanium (Ti2p) of 1.99 or lower.

~~41~~. (previously presented) The catalyst according to claim ~~40~~, wherein said titanium dioxide component comprises titanium dioxide of an anatase type or a rutile type.

~~42~~. (previously presented) The catalyst according to claim ~~40~~, wherein the titanium dioxide has a primary particle size of 10 nm or less in diameter.

~~43~~. (previously presented) The catalyst according to Claim ~~40~~, comprising titanium dioxide that is characterized by an X-ray diffraction (XRD) pattern that is substantially free from patterns other than patterns assigned to anatase type titanium dioxide.

~~44.~~ 48 (previously presented) A catalyst having activity under an irradiation of visible light, said catalyst comprising titanium dioxide having stable oxygen defects and a peak area ratio (O1s/Ti2p) of a peak area obtained by X-ray photoelectron spectroscopy assigned to the 1s electrons of oxygen (O1s) participating in the bonds with titanium to a peak area obtained by X-ray photoelectron spectroscopy assigned to the 2p electrons of titanium (Ti2p) of 1.99 or lower.

~~45.~~ 49 (previously presented) The catalyst according to claim ~~44~~ 48, wherein said peak area ratio (O1s/Ti2p) is in a range of from 1.5 to 1.95.

~~46.~~ 50 (previously presented) The catalyst according to claim ~~44~~ 48, wherein said peak area ratio (O1s/Ti2p) remains substantially constant for time durations of 1 week or longer.

Claims 47-49 (canceled)

~~50.~~ 53 (previously presented) A method for producing a catalyst comprising titanium dioxide having stable oxygen defects and a ratio of a peak area obtained by X-ray photoelectron spectroscopy assigned to the 1s electrons of oxygen participating in the bonds with titanium to a peak area obtained by X-ray photoelectron spectroscopy assigned to the 2p electrons of titanium (O1s/Ti2p) of 1.99 or lower and having activity under an irradiation of a visible light, said method comprising treating the titanium dioxide with hydrogen plasma, characterized by performing said treatment in a state substantially free from an intrusion of air into a treatment system.

51. (previously presented) The method for producing a catalyst according to claim 50, wherein said treatment is performed in a tightly sealed system and said state substantially free from the intrusion of air into the treatment system is a state in which a vacuum degree inside the tightly sealed system takes at least 10 minutes to make a change of 1 Torr.

52. (previously presented) The method for producing a catalyst according to claim 50, wherein said oxide semiconductor is selected from the group consisting of titanium dioxide, zirconium oxide, hafnium oxide, strontium titanate, a titanium oxide-zirconium oxide based complex oxide, and a silicon oxide-titanium oxide based complex oxide.

53. (previously presented) A method for producing a catalyst comprising titanium dioxide having stable oxygen defects and a ratio of a peak area obtained by X-ray photoelectron spectroscopy assigned to the 1s electrons of oxygen participating in the bonds with titanium to a peak area obtained by X-ray photoelectron spectroscopy assigned to the 2p electrons of titanium (O1s/Ti2p) of 1.99 or lower and having activity under an irradiation of a visible light, said method comprising treating the titanium dioxide with a plasma of rare gas, and performing said treatment in a state substantially free from an intrusion of air into a treatment system.

54. (previously presented) The method for producing a catalyst according to claim 53, wherein said state substantially free from the intrusion of air into the treatment system is a state in which a vacuum degree inside a tightly sealed system takes at least 10 minutes to make a change of 1 Torr.

55. (previously presented) The method for producing a catalyst according to claim 53, wherein said oxide semiconductor is selected from the group consisting of titanium dioxide, zirconium oxide, hafnium oxide, strontium titanate, a titanium oxide-zirconium oxide based complex oxide, and a silicon oxide-titanium oxide based complex oxide.

56. (previously presented) A method for producing a catalyst comprising titanium dioxide having stable oxygen defects and a ratio of a peak area obtained by X-ray photoelectron spectroscopy assigned to the 1s electrons of oxygen participating in the bonds with titanium to a peak area obtained by X-ray photoelectron spectroscopy assigned to the 2p electrons of titanium (O1s/Ti2p) of 1.99 or lower and having activity under an irradiation of visible light, comprising the step of introducing ions of a rare gas on at least a portion of the surface of the titanium dioxide by means of ion implantation.

Claims 57-58 (canceled)

59. (previously presented) The method for producing a catalyst according to Claim 50, wherein said oxide semiconductor is an anatase type titanium dioxide.

60. (previously presented) The method for producing a catalyst according to Claim 53, wherein said oxide semiconductor is an anatase type titanium dioxide.

Claim 61 (canceled)

62. (previously presented) A catalyst produced by the method of Claim 50 and having activity under the irradiation of a visible light.

63. (previously presented) A catalyst produced by the method of Claim 53 and having activity under the irradiation of a visible light.

Claim 64 (canceled)

65. (previously presented) The catalyst according to Claim 62, wherein said oxide semiconductor is titanium dioxide, zirconium oxide, hafnium oxide, strontium titanate, a titanium oxide-zirconium oxide based complex oxide, or a silicon oxide-titanium oxide based complex oxide.

66. (previously presented) The catalyst according to Claim 63, wherein said oxide semiconductor is titanium dioxide, zirconium oxide, hafnium oxide, strontium titanate, a titanium oxide-zirconium oxide based complex oxide, or a silicon oxide-titanium oxide based complex oxide.

67. (previously presented) The catalyst according to Claim 44, wherein said activity under the irradiation of visible light is an oxidation activity or a reduction activity.

Claims 68-69 (canceled)

70. (previously presented) The catalyst according to Claim 44, wherein said activity under the irradiation of visible light is a decomposition activity for inorganic and organic substances, or a bactericidal activity.

75. (previously presented) The catalyst according to claim 41, wherein said catalyst is in a substantially granular, thin-film, or sheet shape.

76. (previously presented) The catalyst of claim 41, wherein said catalyst material has been provided on the surface of a base material substrate.

77. (previously presented) The catalyst article according to Claim 76, wherein said base material is an exterior wall of a building, an exterior plane of a roof or a ceiling, an outer plane or an inner plane of a window glass, an interior wall of a room, a floor or a ceiling, a blind, a curtain, a protective wall of highway roads, an inner wall inside a tunnel, an outer plane or a reflective plane of an illuminating light, an interior surface of a vehicle, or a plane of a mirror.

Claims 74-87 (canceled)